

White Paper Report

Report ID: 106064

Application Number: HD5150912

Project Director: James Paradis (jparadis@MIT.edu)

Institution: Massachusetts Institute of Technology

Reporting Period: 4/1/2012-3/31/2013

Report Due: 6/30/2013

Date Submitted: 6/27/2013

White Paper

Grant Number: HD-51509-12

Title of Project: Annotation Studio:
Multimedia Text Annotation for Students

Project Directors: Dr. James Paradis, Dr. Kurt Fendt

Name of Grantee: Massachusetts Institute of Technology

Date: June 27, 2013



Massachusetts Institute of Technology

Annotation Studio: *Bringing a time-honored learning practice into the digital age*

James Paradis, Kurt Fendt, Wyn Kelley, Jamie Folsom, Julia Pankow, Elyse Graham, Lakshmi Subbaraj

I have never annotated before, but I think I'm getting better. I am actually writing down ideas while reading, and by writing them down I'm looking deeper into the text – not like when I just read the book and say, "Oh, it may mean this." Now it is more like, "Oh what does THIS mean?" Then I keep asking questions because I am annotating. I am thinking about the text more.

Student reflection on using Annotation Studio
MIT Literature Class, Fall 2012

Introduction

Annotation Studio is a suite of easy-to-use digital tools for collaborative web-based annotation currently being developed by HyperStudio, the digital humanities lab at MIT. Drawing on HyperStudio's educational design expertise, Annotation Studio integrates a powerful set of textual interpretation tools behind an interface that makes using those tools intuitive for undergraduates and their instructors. Annotation Studio has been partially funded by a Digital Humanities Start-up Grant from the National Endowment for the Humanities.

Conceptually, Annotation Studio extends the centuries-old practice of marginalia as a form of reader engagement to online texts, in the modern context of Vannevar Bush¹ and Theodor Nelson's² notions of knowledge creation through linkage of documents and commentary. Used in conjunction with the large contemporary repositories of text, image, video, and audio available online, Annotation Studio draws students into the experience of primary sources as a "multi-dimensional space," as a "tissue of quotations drawn from innumerable centers of culture."³ It encourages them to become more aware of the "act of reading" by making reading and annotating a transparent and shared process.⁴

Students using Annotation Studio, our ongoing assessment shows, read with greater comprehension and retention and hone their foundational skills of humanities research, writing, and presentation. Through what has been described as the process of "provok[ing] students to reflect more critically upon the primary text," annotations and their associated processes strengthen students' critical thinking and argumentation skills.⁵

The interest Annotation Studio has generated among students and educators has exceeded our initial expectations and is shaping our plans for future development of the prototype. Judging by the groundswell of inquiries from humanities instructors worldwide who are interested in

¹ Vannevar Bush, "As we May Think," *The Atlantic Monthly*, July 1945.

² Theodor Nelson, *Literary Machines: The report on, and of, Project Xanadu*. Sausalito, California: Mindful Press, 1981.

³ Ronald Barthes, "The Death of the Author." *Image, Music, Text*. New York: Hill and Wang, 1977.

⁴ Wolfgang Iser, *The Implied Reader; Patterns of Communication in Prose Fiction from Bunyan to Beckett*. Baltimore: Johns Hopkins University Press, 1974.

⁵ Johanna Wolfe, "Annotations and the collaborative digital library: Effects of an aligned annotation interface on student argumentation and reading strategies," *Computer-Supported Collaborative Learning* 3:141-64, 2008.

adopting the application, we believe that Annotation Studio is responding to an unmet need for an educationally oriented annotation tool that is (a) easy to learn and use for both faculty and students (b) flexible enough to support teaching and learning across a wide range of subjects, settings, and students, (c) easy for educators to adapt to specific classroom needs and constituencies, and (d) easy for programmers to modify for new uses or to integrate with complementary applications.

Drawing on our experience developing and testing the Annotation Studio prototype over the past year, this white paper will discuss:

1. Annotation Studio's historical and conceptual context
2. Qualities that make Annotation Studio unique, including
 - Co-design practices
 - Open-source development processes
 - Classroom orientation and outcomes
3. Plans for future development and deployment

Historical & Conceptual Context

Annotation is a practice with a rich and varied history in the humanities, one intertwined with, and therefore as complex as, the history of reading itself. Practiced extensively by artists and thinkers like Montaigne, S. T. Coleridge, William Blake, Harriet Martineau and Samuel Clemens, to name just a few, annotation was also a formal pedagogy in the universities of Renaissance France and England. Indeed, the impulse to make marks on a page is so widespread and deeply rooted that it seems to reflect not a cultural formation, as is writing itself, but rather a natural one: the kinesthetic dimension of learning. In this respect, annotation is intuitive – a practice that readers would follow even without prior historical direction, and therefore wanders across the timeline of the humanities with irregular bursts and continuities.⁶

Throughout all its variations, however, one dominant theme of annotation that persists is *its enduring connection with the learning process*. Metaphors for reading hint at this connection: for instance, the metaphor of digestion, in which the reader breaks down the text into parts for easier assimilation. The intuition that lies behind these figures is that reading is not only a visual and auditory process, but is also, in important ways, kinesthetic. The act of annotating the page, of reprocessing the text into new and personal forms, is a routine (though often unnoticed) mechanism for readers to focus their attention and enter into the workings of the text. "A marked

⁶ Studies of reading history have established a considerable tradition of textual annotation as a variety of mnemonic, learning, and interpretation practices. See, for example, Stephen A. Barney, ed., *Annotation and Its Texts*, (Oxford: Oxford University Press, 1991); David Greetham, *The Margins of the Text* (Ann Arbor: University of Michigan Press, 1997); Steven Zwicker, "Reading the Margins: Politics and the Habits of Appropriation," *Refiguring Revolutions: Aesthetics and Politics from the English Revolution to the Romantic Revolution*, ed. Kevin Sharpe and Steven N. Zwicker (Berkeley: University of California Press, 1998); H. J. Jackson, *Marginalia: Readers Writing in Books*, (New Haven: Yale University Press, 2001); William H. Sherman, "What Did Renaissance Readers Write in Their Books?" *Books and Readers in Early Modern England*, ed. Jennifer Andersen and Elizabeth Sauer (Philadelphia: University of Pennsylvania Press, 2002); Mary Carruthers, *The Book of Memory: A Study of Memory in Medieval Culture*, 2nd ed., (Cambridge: Cambridge University Press, 2008).

or annotated book," Jackson writes, "traces the development of the reader's self-definition in and by relation to the text," identifying the process with discovery of one's own identity.⁷

Annotation Studio is a web-based, aligned⁸ annotation application that brings the humanistic tradition of annotation into the era of digital media. As it reconnects the reader to the long history of annotation practices, Annotation Studio also opens up the vast resources of digital text, images, and video to seamless marginal commentary. The primary design goal is simplicity of use for both students and instructors, who themselves participate actively in the iterative development process through the term to create a tool for effective educational use. Thus, Annotation Studio can also function as an adaptable tool for ongoing educational innovation.

This intuitive web application engages students in the process of interpreting literary texts and other humanities media documents by searching multimedia collections for relevant materials, posting comments, tagging, and sharing with other users – skills that today's students have already acquired from the many hours they've spent interacting with peers on the Internet. Instead of skimming over difficult passages or feeling frustrated by them, students may use the annotation tool in combination with their new-media skills to engage with the texts their instructors assign. Instead of reading more passively, they read while actively discovering, questioning, annotating, comparing, sampling, illustrating, and representing – activities that John

Box 1: Dr. Wyn Kelley on Developing an Annotation Studio pedagogy

My pedagogy around Annotation Studio started long before I began working with MIT's HyperStudio to develop the tool. I had long been interested in ideas about literary remixing and was already assigning students to research the sources and adaptations of literary texts, especially in my introductory Writing About Literature class, where we spend considerable time with Mary Shelley's *Frankenstein*. The idea was for students to "edit" the novel collaboratively by supplying the historical or literary glosses and essays that one might find in a Norton Critical Edition. I imagined that it might be possible to create a digital version of this idea, one that could provide access to an author's literary influences and writing process through close reading and annotation.

Engaging students more actively in editing their texts and in a digital format opened up possibilities I had never seen before. I found that Annotation Studio's simple design allowed students to access their texts and manipulate them directly. They could select any passage that interested them, add comments and tags, and choose whether to make the comments public or keep them private. Even before we made the comments public, students could see highlights of the text indicating where other students had annotated. This visual effect provided a map of the text showing the interest it generated in a particular group of readers. Students used the workspace not only to note unfamiliar words, mark text for later use in their essays, or record brief impressions—small stuff—but also to return to their ideas at the revision stage and develop them more fully.

⁷ Jackson, *Marginalia*, p. 87

⁸ Aligned annotation refers to annotation systems in which the highlighted target text and its annotation are aligned horizontally in parallel fields, as found in most print marginalia. Other annotation systems that have been developed use the "post-it" model of a floating field, the "in-line" model of an in-text bracketed field, and the "footnote" model of the sub-field. See Joanna Wolfe, p. 141.

Unsworth has dubbed “scholarly primitives.”⁹ By enabling users to tag texts using their own intuitive categories or folksonomies,¹⁰ rather than TEI,¹¹ Annotation Studio allows students to practice using scholarly primitives quite naturally and thereby discover how literary texts can be opened up through exploration of sources, influences, editions, and adaptations.

Annotation Studio's MIT roots

Annotation Studio is grounded in a technology-supported pedagogy that has been developing in undergraduate literature and foreign language classes at MIT over more than a decade. Dr. Wyn Kelley (co-editor of *Reading in a Participatory Culture* for Project New Media Literacies¹²) was an early explorer of approaches to “reading in a participatory culture” and how they might be integrated into literature and writing classes. She had observed that many students viewed reading and writing about classic literature as foreign tasks fraught with difficulty. However, when Kelley asked her students to annotate texts by drawing on multi-media sources, many of their inhibitions disappeared (see Box 1). Imagining themselves as commentators charged with making a text understandable to others, students became more skilled readers and writers.

For the past two years, the HyperStudio team has been collaborating with Kelley and the MIT Literature, Foreign Languages and Literatures, and Writing departments to realize the potential of digital annotation for pedagogy, first through a project called Miximize, and more recently through Annotation Studio. Annotation Studio builds on the design of Metamedia, another pedagogical platform developed at HyperStudio for interactive humanities instruction. Metamedia facilitates learning by providing an online space where students interact with media-rich materials, with one another, and with their instructors, forming online learner communities. Faculty-created projects built on the Metamedia platform have served close to 2,500 MIT students in Literature, Foreign Language and Literatures, Comparative Media Studies, Music and Theater Arts, and History classes – and many remain in continuous use, supported and updated by HyperStudio staff.

Like its precursors, Annotation Studio is intended for undergraduate classroom use and has functionalities that target core humanities skills (close reading, interpretation, argumentation, writing). When fully developed, Annotation Studio will help students turn insights inspired by

⁹ In 2000, John Unsworth defined scholarly primitives as “self-understood” functions common to scholarly activity across disciplines, over time, and independent of theoretical orientation. (John Unsworth: “Scholarly Primitives: what methods do humanities researchers have in common, and how might our tools reflect this?” May 13, 2000, (<http://www3.isrl.illinois.edu/~unsworth/Kings.5-00/primitives.html>, August 17, 2011).

¹⁰ Thomas Vanderwal, “Folksonomy Coinage and Definition,” Off the Top blog post, 2 Feb 2007. <http://vanderwal.net/folksonomy.html>; see also Adam Mathes, “Folksonomies – Cooperative Classification and Communication through Shared Metadata,” Computer Mediated Communication, LI5590 CMS (Doctoral Seminar), Graduate School of Library and Information Science, University of Illinois Urbana-Champaign, December (2004). (<http://www.adammathes.com/academie/computer-mediated-communication/folksonomies.html>, June 17, 2013)

¹¹ TEI, or Text Encoding Initiative, is a scholarly consortium devoted to the creation and use of encoding methods for the digital representation and processing of texts. See www.tei-c.org/index.xml

¹² Henry Jenkins and Wyn Kelly, eds. *Reading in a Participatory Culture: Remixing Moby-Dick in the English Classroom*, NY: Teacher’s College Press, 2013.

close reading into arguments based on evidence derived from primary humanities documents in a variety of media formats.

What makes Annotation Studio unique?

Annotation Studio's distinctiveness is not so much a matter of its functionality – though its combination of features is indeed unique among annotation applications – but is rather a result of the development process used in producing this educational tool. From the start, the Annotation Studio team has been committed to practicing co-design principles, building on the best available open-source tools, using an agile development process, and facilitating a continuous discussion among educators, students, and designers about results in the classroom.

Co-design with students and instructors

The Annotation Studio team is composed of a combination of classroom instructors, designers, and software developers who meet throughout the academic terms, often with student users, to engage in a collaborative design process focused on end users from the start. Feedback from students and faculty using the prototype has continuously informed software development. Intensive efforts are invested in fine-tuning Annotation Studio's core functionality (see Box 2) – not because its basic features do not work as intended, but because users are able to suggest how core functionality can be modified to fit their needs even better. Rather than expanding the number of advanced features built into the application, the team focuses on simplifying core features from the student's and instructor's perspectives. The resulting application's elegance and simplicity is the result of a sustained process of iterative co-design with the targeted user population (see the screen shots in the Appendix A). While this approach may result in fewer features, it also ensures that selected features are refined to serve the purposes of our targeted users, setting our tool apart from commercially available, multi-purpose software. We believe that Annotation Studio is better designed for humanities teaching and learning than any other tool of its kind because we have taken a user-first rather than a features-first approach.

Use of open source technologies

In considering how best to build the proposed annotation application, we surveyed the field of available open source software related to our project and discovered that the Open Knowledge Foundation's *Annotator* included a core set of features that supported and complemented what we proposed to develop. By choosing to build on the Annotator's strengths rather than creating all of the proposed features from scratch, we significantly accelerated software development, which allowed us to focus on distinctive needs associated with using annotations in an educational context. Accelerating software development also enabled us to invest more of our limited

Box 2: Core functionality of the prototype

- Texts of any length can be annotated.
- Users can annotate collaboratively.
- Users can create user groups with user-selected privacy settings.
- Online media documents can be added to annotations.
- Text and associated annotations can be tagged using folksonomies.
- Documents carry Dublin Core-based metadata along with copyright status including Creative Commons licensing.
- Documents and annotations can be made private or shared with groups, subgroups, or the wider public.
- Users can filter documents and annotations to view relevant subgroups.
- Application supports user-downloaded and user-generated source texts.

See screen shots in appendices for illustrations.

resources to working with faculty users to tailor the tool and integrate it into their curriculum and instruction. Just as significantly, our decision to incorporate the Annotator has connected us with an international community of developers, theorists, and educators who are actively collaborating to produce a common core of adaptable annotation software and to develop a W3C¹³ open annotation standard that supports the users' ability to exchange and reuse annotations across tools and platforms. The groups with which we have established the strongest connections include:

- Hypothes.is, a nonprofit building an open web annotation tool on the Annotator
- Harvard University and Massachusetts General Hospital
- The W3C Open Annotation Community Group
- The Open Knowledge Foundation, originator of the Annotator, and an organizer of open source software projects for open knowledge.

Technical specifications

Annotation Studio is developed as an open source web application, based on state-of-the-art web design and development technologies and methods (see Box 3). Its interface provides users with a web browser-based reading and note-taking workspace written in HTML, CSS, and Javascript. On the server side, the latest Ruby on Rails framework accelerates development and is hosted on Heroku's "Platform as a Service," which enhances and accelerates deployment and scaling. Details of the front-end and back-end computational design are provided in our Final Performance Report to the National Endowment for the Humanities and on the Annotation Studio website: <http://www.annotationstudio.org>.

Focus on classroom integration and learning outcomes

From the start, Annotation Studio has been conceived as an educational tool; therefore, our co-design partners have been students and teachers, our testing environment has been the classroom (13 undergraduate classes during the 2012-2013 academic year), and our measures of success (other than ease of use) have been entirely defined by educational outcomes. Concurrent classroom integration has been critical to the iterative development process of Annotation Studio and bi-weekly pedagogy meetings with participating faculty have supported the development of new teaching and learning practices.

We conducted a qualitative assessment of the prototype's use in the courses where it was piloted during the fall 2012 and spring 2013 semesters, primarily to identify what worked well and what

Box 3: Technical specifications

- Annotation Studio's user interface is written in HTML, CSS and Javascript.
- Backbone.js supports user data display and navigation.
- Twitter Bootstrap and jQuery support user interface controls, layout, and design.
- All user and group management and document organization is built in Ruby on Rails, integrating existing HyperStudio open source software .
- Annotation data is stored in the MongoDB database via a RESTful web API written in Node.js, which enables reuse, visualization, and analysis of annotations.
- The open source Annotator editor is built in Coffeescript/Javascript by the Open Knowledge Foundation. Github and Heroku support collaboration and deployment.

¹³ W3C, or World Wide Web Consortium, is an international consortium devoted to promulgating WWW guidelines and protocols that ensure open access and long-term growth of the web. See www.w3.org/consortium/

needed to be changed to support ease of use and learning goals. Evidence from this preliminary assessment activity – which included surveys, observations, and interviews with faculty and students – showed that use of Annotation Studio supports:

- ✓ Close reading: paying attention to details, not just broad themes or plot.
- ✓ Strengthening memory of texts read, with marked improvement of recall during discussions.
- ✓ Generating original material that can be developed into essays.
- ✓ Taking effective notes, quoting passages responsibly, citing sources.
- ✓ Developing arguments; making connections across texts; formulating questions.
- ✓ Developing a distinctive critical voice and confidence in one's own opinions.
- ✓ Creating a community around reading, writing, and classroom discussion.

Common themes of students using Annotation Studio are that it encourages them to read more closely, to clarify the meaning of certain words and phrases, to ask themselves more questions while reading, and to build a critical awareness of the results of their reading practices. The following two observations reflect some of these themes:

“When I started annotating online, I ended up doing much more than I would usually do in the hard copy of the text. I ended up doing a word-by-word analysis of the passage. It was very easy to organize my thoughts in Annotation Studio where I had everything I needed highlighted and with comments.”

“The [physical] book just gives you the raw material . . . But when I go online then I can get actual ideas behind the words. I can expand on things more clearly and carefully.”

Many students also noted that Annotation Studio helps them compose papers, as the following comments indicate:

“I noticed that when I have to write in a book, I have to write in short phrases. You just write enough to jog your memory . . . But online I write like a full paragraph. It was really nice when I went back and saw, Oh my god, I wrote a lot! I already had my thoughts right there so I could just cut it and paste them in my paper. Just to have this space to write in is great.”

“Annotation Studio definitely made it easier for me to write my assignments . . . everything was organized and right there . . . I did not just copy and paste them [annotations] but I developed my ideas further. The initial annotation sparked me and let the rest of the paragraphs get developed.”

“When you see other people's annotations, you think, ‘Oh. I have never thought about this . . . Now when you mention it, I can see this point in many places in the book and could probably write a paper about it’”

Implicit in most of these student comments is a sense of discovery that annotation is fundamentally intuitive and that it reinforces learning, memory, and writing. In important ways, Annotation Studio has reconnected them to the long and distinguished history of this widespread humanist practice. The thoughtful reflections of Freshman Lakshmi Subbaraj about her use of Annotation Studio throughout the fall term of 2012 capture most of these themes (see Box 4). Instructors, too, have found that the activity of student annotation has provided an entirely new set of options for engaging with students (see Box 5).

Box 4: A student's narrative of her progress with Annotation Studio

As a freshman at Massachusetts Institute of Technology, I was first encountered Annotation Studio in an introductory literature class called Reading Fiction. This was the first time in all my years of education that I had been introduced to a tech tool used for a humanities class. My initial expectation was that we would use Annotation Studio as a supplement to our class work, maybe just to share thoughts between classmates. Instead, Annotation Studio was an integral part of every one of our reading and writing assignments.

Our first assignment with Annotation Studio was to create annotations online so that our professor could see our thoughts about the text. At first, this seemed to be no different than taking notes in the book itself or on a separate piece of paper like I would normally do, but I quickly realized Annotation Studio's advantages. Annotation Studio keeps all our annotations visible as we scroll through the text, which was very useful for me because I could keep track of certain themes or ideas I was interested in and wanted to follow. With paper, annotations can be lost in a jumble of notes.

Annotation Studio was even more useful to me during the writing process than the reading process. The compilation of annotations I had made while reading were all available for me to sift through as I connected ideas to create a thesis for my paper. Annotation Studio provided a great starting point for an essay, which is often the most difficult part.

One of my most memorable experiences with Annotation Studio was with an assignment for which we had to write a paper explaining the significance of literary allusions in *Jane Eyre*. I was a bit overwhelmed at first because Bronte used many allusions and I had to pick one that would provide enough material for my paper. Our professor suggested we use Annotation Studio to help us get organized and find allusions in the text. As I read the novel, I annotated any allusions to Shakespeare as I was interested in Bronte's extensive use of Shakespeare's work. Soon I had compiled a list of annotations that highlighted significant allusions. From this comprehensive list, I was able to narrow down my choice to Macbeth because my notes on allusions to Macbeth were extensive and I could formulate the thesis that Bronte and Shakespeare used similar devices to emphasize a certain theme. When I had reached the end of my search, I was very surprised at how efficiently and effectively Annotation Studio had helped me jump-start my essay.

Without Annotation Studio, I would have had to collect my notes on pieces of paper and try to compile them in one place in order to organize my thoughts and ideas and find connections. With Annotation Studio, I could also easily go back to the exact word, sentence or paragraph pertaining to my annotations to rethink my logic and ideas that lead to my thesis. Once I had chosen the text to focus on and had done some research on Macbeth to identify themes similar in both texts, I went back to Annotation Studio to help me find specific examples and evidence to write a concrete paper. I went back to the locations I had already marked and conducted a closer reading of the text, adding to my previous annotations with deeper analysis from my research. Not only did Annotation Studio help me start my paper, but it also helped me provide solid evidence to support my thesis. I was extremely proud and impressed by the efficiency and quality my essay, all with the help of Annotation Studio.

As the semester wore on, I began to use this approach to all my essays: first starting with my annotations to create a preliminary thesis and then going back to specific areas in the novel to annotate further and create a stronger basis for my essay. Using this approach, I saw a steady improvement in my writing skills. I also was able to contribute to class discussions much more effectively because of annotations I had done to prepare for class. Because of this pattern that I had developed, I became confident in my writing and enjoyed approaching the essays much more than at the beginning of the year.

After a whole year of using Annotation Studio, I am extremely glad I was introduced to this tool because it helped my build and develop confidence in my reading and writing skills and the way I approach literary analysis.

Lakshmi Subbaraj, MIT Student

Box 5: Instructors' comments on their classroom uses of Annotation Studio and its impact

I used Annotation Studio in class for exercises in close reading and class discussion, finding that students adapted to it quickly and easily as a way to share a text and comments. In fact, I noticed that students were also taking notes in Annotation Studio, keying their own remarks or those they'd heard in class directly to the places in the text we discussed. This classroom note-taking use arose naturally from the students' rapid understanding of the ways Annotation Studio could focus and expedite their work.

More often, the annotations took place outside of class, as students prepared for reports and essays. My assignments include detailed instructions on how to use Annotation Studio as a tool for assembling examples of a theme, inserting historical data or other kinds of notes into the text, and developing first impressions into more thoughtful readings. I was struck by two changes from my students' usual practices in preparing for essays. One was that they quoted more often and more aptly from the text. The simple act of selecting text before writing a comment meant that they could not generalize about the text, as they are prone to do when they are unsure of what to say. Annotation Studio gave them materials precisely selected for their essays, which they could then shape and develop. The second effect was that they took their research more seriously. Since I often asked them how an author's reading or historical circumstances influenced the text, they could now find and annotate specific examples, add what they'd learned from their research, and then include these in their essay for analysis. I was startled at the increased confidence and expertise my students gained from this work. By entering the text's world as editors, rather than as disempowered readers or inexperienced writers, they discover unexpected skills in themselves and take unanticipated pleasure in the text.

Wyn Kelley, Senior Lecturer in Literature, MIT, Fall 2012

I used Annotation Studio on a very limited basis, for two in-class close-reading exercises. I was curious to see how useful it would be if the students only worked with it once or twice.

In class, I hooked up my computer to a projector and spent a few minutes showing the students how to use Annotation Studio. I then gave them ten minutes to annotate the passage from Jane Eyre that I had chosen. The students enjoyed the process so much that they asked for more time; I gave them another ten minutes, but they could easily have gone longer. Next, using the projector, we went through the passage together. I would point out a word or phrase that had been highlighted and ask the students who had marked it to discuss their annotations. We spent about a half-hour discussing the students' comments and could easily have taken more time.

This in-class reading exercise was a great success. One aspect that I had not expected was how eager the students were to discuss their annotations. Even my two shy students spoke confidently; it was clear that, having already worked out ideas about the text, they were more comfortable discussing it . . . It was also instructive to be able to view students' comments in real-time: I gained an eye-opening window on their thought processes, I got a quick sense for the parts of the text it would be productive to focus on for discussion, and I was able to respond to their comments as they wrote them.

Although students did not articulate much of an interest in Annotation Studio's inherent sociality, it was clear to me that this had also positively affected them. The students often responded to one another's comments during the annotation time, and they were interested in comparing interpretations. It was also clear that the exercise was beneficial as a pre-writing activity: several students expanded on their annotations in their Jane Eyre essays.

What surprised me most about using Annotation Studio was how eager it made me to take a more experimental approach to my teaching. Annotation Studio had real advantages compared to doing the same exercise on paper—for both the students and for me—and moreover, the experience went so well that it opened me up to taking more risks by trying new tools in the classroom.

Julia Panko, Postdoctoral Fellow in Literature, MIT, Fall 2012

Project outreach

The project team presented this project and its findings at the following conferences and professional meetings:

• New Media Consortium	Boston, MA	June 2013
• Digital Humanities 2012	Hamburg, Germany	July 2012
• NEH Grantee Meeting	Washington, D.C.	September 2012
• Digital Humanities Colloquium	University of Chicago	November 2012
• Digital Humanities Symposium	George Washington University	January 2013
• Days of Digital Humanities	Northeastern University	March 2013
• MEL Camp	Texas A&M University	March 2013
• Annotation Workshop	Harvard University	March 2013
• iAnnotate Workshop	San Francisco, CA	April 2013

In addition, the project team conducted several outreach events at MIT to engage as many faculty as possible in the co-development and classroom integration process that is fundamental to Annotation Studio's ongoing development.

As noted above, this outreach activity has resulted in a constant flow of queries from university faculty and other educators interested in using the prototype and finding out when the application will be ready for widespread adoption. As of June 2013, well over 100 educators representing 60 colleges and universities throughout the United States and abroad have written to express their interest and request further information. Several have entered into discussion with the HyperStudio team about potential uses of the Annotation Studio application. For example, Professors Chantal Wright and Dan Vyleta of the University of Wisconsin at Milwaukee are interested in using Annotation Studio to enhance the teaching of translation using the juxtaposition/comparison and cross-text annotation functions that we are currently developing.

In response to this intense interest in Annotation Studio, the development team has also created a public website introducing the application and allowing visitors to explore the prototype:
<http://app.annotationstudio.org>

Plans for Future Development & Deployment

A year of developing the Annotation Studio prototype has demonstrated that the introduction of annotation into the classroom offers many fresh and attractive learning options to both instructors and students. Ongoing development of the prototype will continue to be centered on our classroom efforts, and our priority will continue to be that of developing a robust and intuitive application that users can depend on. Feedback from users in the fall 2012 and spring 2013 – gathered from focus-group sessions with students, student critiques, and regular pedagogical meetings with instructors – has helped us generate a priority list of features that we will include in the completed application. These include:

1. Easy user uploading of documents for annotation. Faculty and students using the MIT internal application and partner users of the public application are eager to be able to upload their own electronic texts – including both source texts and student-authored essays – in a variety of formats including PDF and Word. Currently, users *can* upload texts, but since the texts must first be converted to HTML format, few users have the skills or patience to do so. For prototype testing, the HyperStudio team has been uploading all texts for annotation, but widespread adoption of

Annotation Studio will require our developing a simple, transparent way for instructors and individual users to do this themselves.

We have always planned for future iterations of Annotation Studio to support simple user uploading of texts in a range of formats (including TEI), but had postponed implementation of this feature to a later phase of development, not anticipating the demand that the prototype's success has generated or the eagerness among faculty across the country to begin using it in their classrooms. In order to make rapid, widespread adoption possible, functionality that supports easy uploading of texts in a variety of formats has become a top priority on our software development agenda.

In addition to making it possible for users to easily upload source texts for annotation, this functionality will also support uploading student-created essays, making them available for annotation by faculty, writing instructors, and/or peers.

2. A fully developed public website for instructors and students. This site will provide 1) comprehensive documentation on the use of Annotation Studio, and 2) a community section where instructors can exchange experiences in using Annotation Studio in the classroom. Together with functionality that makes uploading texts easy, the website will be designed to minimize the user's need for assistance, thus supporting the scalability of Annotation Studio as a flexible educational tool.

3. Ability to export user annotations for future use in essays and other compositions. The ability to gather one's own annotations and transfer them to a new file is the most significant feature request that we had not fully anticipated. Students and instructors have often requested that they be able to reuse annotations in compositions, notebooks, and other formats. Since annotations also carry the originally quoted text along with the student comments, plus the metadata of the text, such a feature will also support better citation practices among students.

4. Fine-grained annotation of images. Students and faculty alike have often requested the ability to annotate parts of images to express their arguments using different media. Images for annotation can either be embedded with the base text or used as standalone image files.

5. Color-coding of annotations. Users have requested the ability to color-code annotations by self-defined criteria (e.g. based on tags, questions, locations, etc.) and by author. Building on this request, we will also implement other graphical options to mark annotations within a given text, including underlines and boxes around selected passages.

6. Flexible management of texts associated with specific courses and user groups. Based on user feedback, we will be developing a scalable mechanism to effectively display and group documents being used by specific courses and learner communities (e.g. classes, working groups within classes, etc.)

7. Search and filtering features that allow students to sort and organize their annotations. Students will be able to filter annotations by tag, author, source document, timestamp, content, or privacy setting. Students will also be able to group and arrange annotations visually or semantically in a separate workspace in order to help them construct an argument.

8. Search and filtering features associated with the source texts. This obvious feature will allow students to search for specific words and phrases in the primary texts they are annotating.

9. Visualization tools that facilitate navigation and interpretation. As we have already experienced while testing the Annotation Studio prototype, students may create hundreds of annotations over the course of completing a assignment. For example, a class of only 12 students created more than 800 annotations on a single document, which presented problems associated with scale and navigation. In order to solve these problems, we plan to employ visualization mechanisms for filtering and analyzing large volumes of annotations. Visualization tools will also support navigation through the source text and analysis of patterns both in the source text and associated annotations.

In addition to implementing these new features, we also plan to design and conduct a robust assessment of learning outcomes associated with Annotation Studio over the next two years.

Conclusion

The Annotation Studio prototype opens up a world of humanities education and digital humanities exploration that has already excited a number of students, experienced educators, and scholars. By reconnecting readers of electronic texts with the age-old learning and scholarly practices of writing marginalia, this powerful yet easy-to-use tool brings a range of new options to the humanities classroom.

The response to Annotation Studio this past academic year has been unexpectedly enthusiastic both on the part of students and instructors, which is explained partly, we feel, by the fact that writing marginalia is an intuitive, pleasurable learning experience. Book critic Sam Anderson captures this sense of delight in a lovely reflection "What I really Want is Someone Rolling Around in the Text" in the *New York Times Sunday Magazine*.¹⁴ Annotating, he writes, "quickly began to feel, for me, like something more intense [than college study]: a way to not just passively read but to fully enter a text, to collaborate with it, to mingle with an author on some kind of primary textual plane." Annotating changes us from classroom students to engaged readers. "Writing in [books]," he reflects, "is the closest I come to regular meditation; marginalia is – no exaggeration – possibly the most pleasurable thing I do on a daily basis." In the classroom, this unexpected pleasure can add fresh motivation to a wide range of new teaching practices that draw on students' already-extensive experience with using digital media.

Based on our experience developing, deploying, and refining the Annotation Studio prototype, we are convinced that its success derives from our commitment to (1) designing the application in close collaboration with teachers and students, (2) using open-source tools and adhering to open standards, and (3) concentrating on perfecting core functionality as informed by user feedback. The simplicity of Annotation Studio's design and its focus on core annotation activities ensures applicability in a wide range of educational settings while providing a reliable foundation for adding advanced features.

In addition to its value as an educational application, Annotation Studio holds considerable promise for scholars interested in exploring the potential of digital tools for visualization and large corpus analysis. Although prototype development has been focused on classroom use, the

¹⁴ Sam Anderson, "What I Really Want Is Someone Rolling Around in the Text," *New York Times Sunday Magazine*, (March 6, 2011), p. MM46.

application also provides a framework for developing innovative approaches to processing text and its metadata. We plan to integrate additional tools as plug-ins that can extend the functionality of Annotation Studio to serve different educational needs. For example, text mining functionality such as named entity recognition (NER) will make it possible for students and scholars to map place references automatically or to visualize characters across an entire text. Using annotations as a basis for visualizing reader interaction with a text can also facilitate new insights into the mental processes of reading and meaning making. Future iterations of Annotation Studio will make such analysis possible.

Moving ahead, the Annotation Studio development team will build on the success of the past year, working with educators across the country to integrate the application into a broad range of humanities classrooms and to explore its potential for building close reading, interpretation, argumentation, and writing skills. At the same time, we will work with the growing network of open source annotation developers to expand Annotation Studio's functionality while maintaining its core strengths: flexibility, simplicity, and responsiveness to the user experience.

Appendices

- A. Annotation Studio Screen Shots
- B. Sample Annotation Studio Assignments
- C. Bibliography

APPENDIX A: Annotation Studio Screen Shots

The screenshot shows the Annotation Studio web application interface. The browser address bar displays the URL `app.annotationstudio.org/documents/moby-dick-chapters-1-5-mel-camp-2013`. The page title is "Moby Dick, Chapters 1-5 (MEL Camp 2013)". The interface is divided into three main sections:

- Left Sidebar (Extracts):** A list of chapter extracts including "Loomings", "The Carpet-Bag", "The Spouter-Inn", "The Counterpane", and "Breakfast".
- Central Text Area:** Displays the text of Moby Dick, Chapters 1-5. Several passages are highlighted in yellow, indicating annotations. These include:
 - "He visited this country also with a view of catching horse-whales, which had bones of very great value for their teeth, of which he brought some to the king. * * * The best whales were caught in his own country, of which some were forty-eight, some fifty yards long. He said that he was one of six who had killed sixty in two days." Other or Octher's verbal narrative taken down from his mouth by King Alfred. A.D. 890.
 - "And whereas all the other things, whether beast or vessel, that enter into the dreadful gulf of this monster's (whale's) mouth, are immediately lost and swallowed up, the sea-gudgeon retires into it in great security, and there sleeps." MONTAIGNE. -- Apology for Raimond Sebond.
 - "Let us fly, let us fly! Old Nick take me if it is not Leviathan described by the noble prophet Moses in the life of patient Job." Rabelais.
 - "This whale's liver was two cart-loads." Stowe's Annals.
 - "The great Leviathan that maketh the seas to seethe like boiling pan." Lord Bacon's Version of the Psalms.
 - "Touching that monstrous bulk of the whale or ork we have received nothing certain. They grow exceeding fat, insomuch that an incredible quantity of oil will be extracted out of one whale." Ibid "History of Life and Death."
 - "The sovereignest thing on earth is parmacetti for an inward bruise." King Henry.
 - xlii-
 - "Very like a whale." Hamlet.
 - "Which to secure, no skill of leach's art Mote him availle, but to returne againe To his wound's worker, that with lowly dart, Dinting his breast, had bred his restless paine,
- Right Sidebar (Annotations):** A list of annotations, each with a small image and text. The annotations include:
 - "beautiful"
 - "Yes, Tim, I think of this too. Just seeing if w"
 - "King Alfred. A.D. 890."
 - "Mary I."
 - "hi"
 - "This has always made me think of HM's con"

Exhibit 1: Text and annotation view


On the left, chapters can be selected to navigate the text. Annotated passages are marked in yellow in the text, and a list of annotations is displayed on the right. The passage associated with a selected annotation is marked in the text (see black talk-bubble icon) and also appears with the annotation, which can contain images and links to any web-based document including video, sound files, and PDFs.

A Study in Scarlet

Annotations

Exhibit 2: Making and viewing annotations

Here, a student has highlighted the word "Malwand" causing the annotation button to appear. When the button is clicked, the annotation editor opens.

When an annotation is saved, a copy of the highlighted text appears with its annotation in the sidebar. In this example, an annotation created for the phrase beginning with "One's ideas..." has been clicked and is therefore expanded to display its contents in the sidebar. The position of the annotated phase is also flagged in the source text with a talk-bubble icon  so it can be easily located.

"That's rather a broad idea," I remarked.

■ "One's ideas must be as broad as Nature if they are to interpret Nature," he answered. "What's the matter? You're not looking quite yourself. This Brixton Road affair has upset you."

"To tell the truth, it has," I said. I ought to be more case-hardened after my Afghan experiences. I saw my own comrades hacked to pieces at Malwand without losing my nerve."

"I can understand. There is a mystery about this which stimulates the imagination; where there is no imagination there is no horror. Have you seen the evening paper?"

"No."

"It gives a fairly good account of the affair. It does not mention the fact that when the man was raised up a woman's wedding ring fell upon the floor. It is just as well it does not."

"Why?"

"Look at this advertisement," he answered. "I had one sent to every paper this morning immediately after the affair."

He threw the paper across to me and I glanced at the place indicated. It was the first announcement in the "Found" column. In Brixton Road, this morning," it ran, "a plain gold wedding ring, found in the roadway between the White Hart Tavern and Holland Grove. Apply Dr. Watson, 221B, Baker Street, between eight and nine this evening."

"Excuse my using your name," he said. If I used my own, some of these dunderheads would recognize it, and want to meddle in the affair."

"That is all right," I answered. But supposing anyone applies. I have no ring."

This is analogous to saying that human nature

Told from the point of view of Dr. Watson

"One's ideas must be as broad as Nature if they are to interpret Nature,"
hume's controversy of humans being capable of understanding and explaining nature. do humans have the capacity to understand nature even tho they did not create it? man-made machines < nature's machines...

Mali W.

Sherlock has developed a theory

imagery of contrast. old and rugged vs. young

This is reminiscent of the arguments between

This murder is linked to the first murder. Murd

Watson is observing Holmes and trying to und

Gregson's theory for how the murder happen


Another murder

The glass of water and pills are something tha

This reaction of his is decidedly against the hu

sherlock - Philo type in his unfocused intentic

dr jekyll/mr hyde syndrome? split personality

Annotation Studio
Documents
Help
Kurt Fendt
Logout
Manage Users


A Study in Scarlet
Annotations

-40-

"That's rather a broad idea," I remarked.

"One's ideas must be as broad as Nature if they are to interpret the world," he answered. "What's the matter? You're not looking quite yourself today. The Brixton Road affair has upset you."

"To tell the truth, it has," I said. I ought to be more case-hardened after my Afghan experiences. I saw my own comrades hacked to pieces at Maiwand without losing my nerve."

"I can understand. There is a mystery about this which stimulates the imagination; where there is no imagination there is no horror. Have you seen the evening paper?"

"No."


"It gives a fairly good account of the affair. It does not mention the fact that when the man was raised up a woman's wedding ring fell upon the floor. It is just as well it does not."

"Why?"

"Look at this advertisement," he answered. "I had one sent to every paper this morning immediately after the affair."

He threw the paper across to me and I glanced at the place indicated. It was the first announcement in the "Found" column. In Brixton Road, this morning, it ran, "a plain gold wedding ring, found in the roadway between

Town in Afghanistan, Province Kandahar, 1880



location, war

Kurt F.

...ous to saying that human nature

... point of view of Dr. Watson

...oversy of humans being capable

...developed a theory

...contrast, old and rugged vs. young

...scent of the arguments between

...linked to the first murder. Murd

Watson is observing Holmes and trying to und

Gregson's theory for how the murder happen

Another murder

The glass of water and pills are something tha

This reaction of his is decidedly against the hu

sherlock - Philo type in his unfocused intentic

dr jekyll/mr hyde syndrome? split personality

Sherlock Holme's eccentric personality

Sherlock's "profession"

Up til this part in the story is very similar to the

First time Watson goes to a crime scene with H

Sherlock loves to be admired

Interesting twist in the case. Old woman come

The box of pills was a mix of poison and placel

Exhibit 3: Connecting text with annotations

When the reader “mouses over” the highlighted word (**Malwand**), the annotation appears above it.

In this case, the annotation contains an image embedded by the reader plus tags and the reader's name.

The screenshot displays the Annotation Studio web application. The browser address bar shows the URL `app.annotationstudio.org/documents/moby-dick-chapters-1-5-mel-camp-2013`. The page title is "Moby Dick, Chapters 1-5 (MEL Camp 2013)". On the left sidebar, a list of document sections includes "Extracts", "Loomings", "The Carpet-Bag", "The Spouter-Inn", "The Counterpane", and "Breakfast". The main text area shows a passage from "Moby-Dick" with several annotations. A tooltip is overlaid on one of the annotations, displaying the text: "Yes, Tim, I think of this too. Just seeing if we can converse here. And I'll add a tag." Below the text, the annotation is labeled "BBQ" and includes a comment: "This has always made me think of HM's comment on NH in a letter to Duyckinck that he thinks that Hawthorne needs to eat rare roast beef? Is Queequeg a representation of what he wished NH could have been? Dennis -- the only way I can respond is to edit by original response! The BBQ last night was nicely cooked (thank goodness) and much thanks to you for your gracious generosity!". The annotation is attributed to "Hawthorne, Queequeg". The right-hand panel shows a list of annotations, including "Milton's archangel? Foreshadows the prop", "Who does Melville consider 'ancient'? Our", "Both a painter and an archangel. Is this nan", "What was the classical term for the fart to w", "Some theorists today try to be just such an", "a put-down of librarians and people such a", "I have heard of Krakens!", "All these people are supposed to be in secc", "Beautiful!", and "Yes, Tim, I think of this too. Just seeing if w".

Exhibit 4: Overlapping annotations

Multiple users can annotate the same portion of a text. Annotations are shown in aggregate form for comparison.

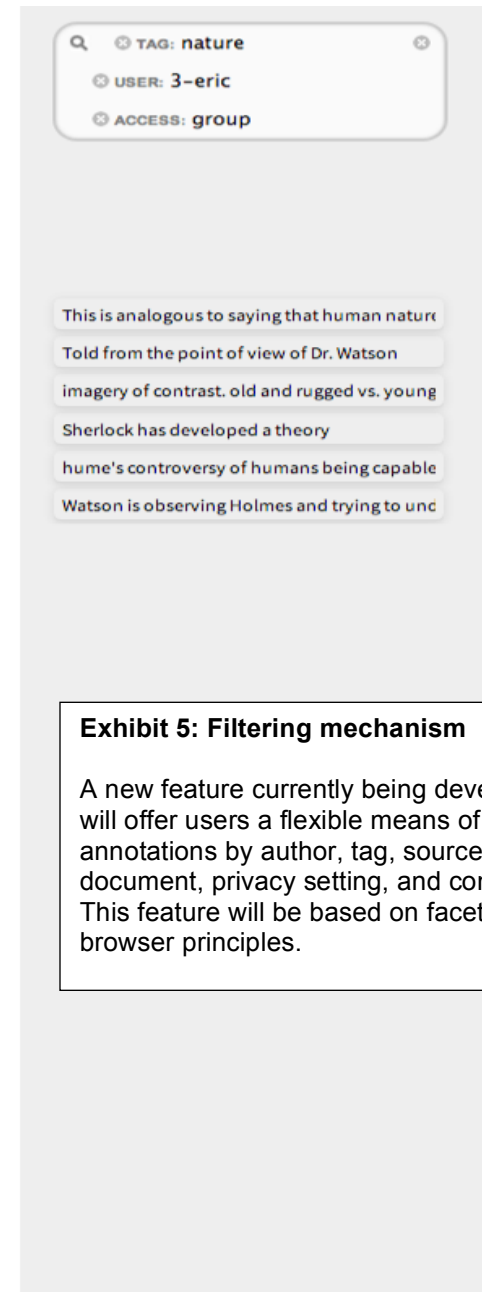
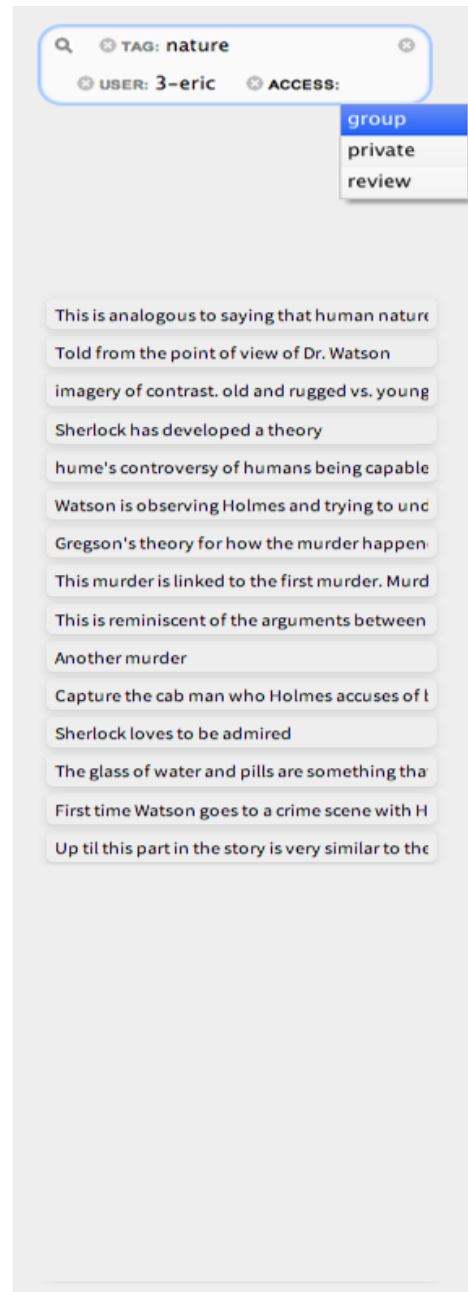
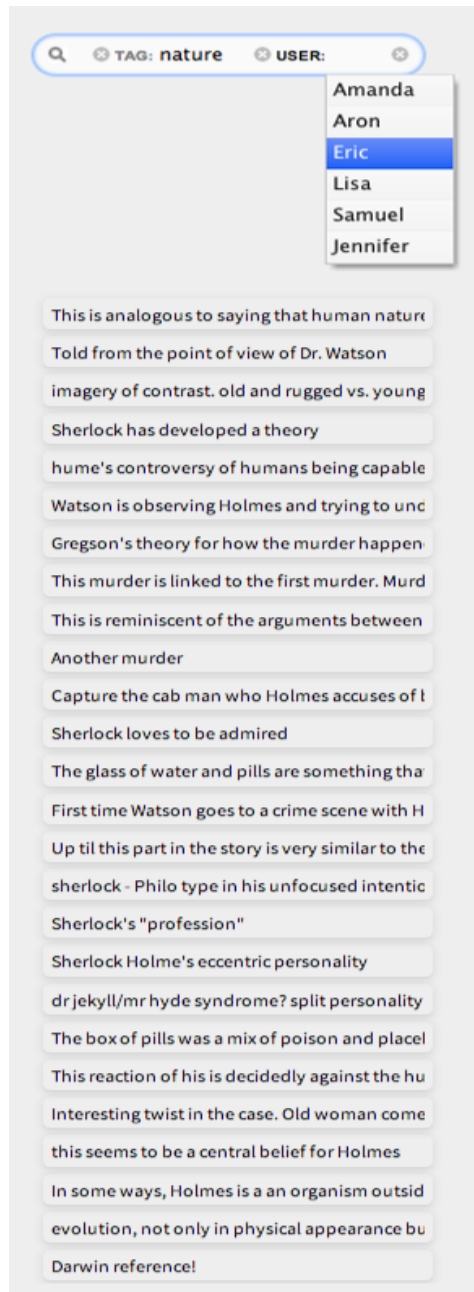


Exhibit 5: Filtering mechanism

A new feature currently being developed, will offer users a flexible means of filtering annotations by author, tag, source document, privacy setting, and content. This feature will be based on faceted browser principles.

APPENDIX B: Sample Assignments Using Annotation Studio

Course: **Writing About Literature**
 Massachusetts Institute of Technology, Fall 2012

Instructor: Dr. Wyn Kelley

Essay 1 (1250 words)

For this essay you will complete a set of steps listed below to produce a five-page (1250 words) reading of details in a chapter from Mary Shelley's *Frankenstein*. Your job is to move away from general statements about the text and challenge yourself and your peers with more information and insight.

Goals

1. To use annotation to observe and document your own process of reading
2. To focus on details and let your ideas emerge from the text

Writing Skills

1. Close reading of language
2. Development of observations in clearly structured and well-formed paragraphs
3. Correct use of grammar and sentence structure
4. Correct use of MLA Works Cited format

Process

1. Read Volume 1, Chapter IV (pp. 34-38, *Norton Critical Edition*) of the 1818 edition of Shelley's *Frankenstein*.
2. Go to **Annotation Studio** (<http://annotationstudio.mit.edu>). Follow the instructions for registering at the site and familiarize yourself with the tool, if you have not done so already.
3. Using Annotation Studio, annotate the online text of this chapter. Mark striking passages, unfamiliar words, details that amuse or puzzle or move you, references to sources, unusual phrasing, or words that point to important issues for understanding character or theme in the text. Add comments for later consideration.
4. You may annotate as many details as you wish and make your comments any length. Some suggestions for ways to organize your work:
 - Try to get a variety of different *kinds* of annotations, from the personal impression, to something that requires looking up information in a dictionary or encyclopedia, to something reflective or interpretive.
 - Alternatively, note examples of a certain phenomenon you have noticed: sensory images, or place names, or allusions to other authors, or language reminiscent of details from elsewhere in the novel.
 - Cover material from various parts of the chapter or alternatively focus on a particular paragraph or moment. Consider why you have chosen the approach you did.
5. When you have finished your online annotation, you can begin developing the data you generated through this work.
 - Find information to answer questions you have about certain details.
 - Look for patterns in the details you notice—certain repetitions of sounds, words, or phrases, or conversely significant breaks or changes in a pattern.

- See what questions or discoveries your annotations inspire. Do multiple readings of a certain passage suggest meanings you did not see at first? Does Shelley use certain references or kinds of language for a particular effect? What parts of the chapter seem most energetic and immediate? Do you see a certain change in the focus of the chapter?
- 6. Having taken notes on your annotations, please write your paper as a report for your peers on what emerged from your study of the chapter's details.
 - You may speak in the first person about your process of reading and thinking about the text.
 - You may choose a format that works for you; no need to employ a five-paragraph structure or to advance an argument.
 - You can entertain questions and doubts and withhold answers and certainties.
- 7. For material from outside sources (consider a dictionary or encyclopedia a source), use MLA Works Cited format, and make a Works Cited list at the end of the paper. Your Norton Edition of *Frankenstein* should be cited correctly.

Course: **Darwin and Design**
 Massachusetts Institute of Technology, Fall 2012

Instructor: Professor James Paradis

Course Description

In the *Origin of Species* (1859), Charles Darwin gave us a model for understanding how natural objects and systems can evidence design without positing a designer: how purpose and mechanism can exist without intelligent agency. Texts in this course deal with pre- and post-Darwinian treatment of this topic within literature and speculative thought since the eighteenth century. We will give some attention to the modern study of feedback mechanisms in artificial intelligence. Our reading will be in Hume, Voltaire, Malthus, Darwin, Butler, H. G. Wells, and Turing.

...

In this class, we will make use of a special digital humanities application called **Annotation Studio** to develop annotations of selected texts.

Annotations are reader-generated comments and reading notes on a primary text, developed around the reader's interests or around a set of *tags* or key terms offered by the instructor. The goal of developing annotations is to enable the class to engage in close readings of the work under consideration, as well as to build up notes for prospective papers.

...

Reading Assignment: Alice's Adventures in Wonderland, chapters 1-5, 7

As you read the assignment, please contribute a minimum of 3 thoughtful annotations on one or more of the topics below. An annotation comment may be from 3 to 5 sentences long and may be offered in full sentences or fragments, or even illustrations with comments. If you wish, you may tag your annotation with a key word.

Please post your annotations no later than noon on Sunday. You should read the annotations that have been posted before you come to class and be ready to comment briefly about your own annotation. Here are some possible topics to annotate --

1. As you read, find passages that tell us something about what kind of natural world the inhabitants of Wonderland live in. Make an observation about this world. Is it closer to the natural world of Genesis or to Aristotle's natural world?
2. Find examples of rational or irrational thinking in the conversations of Alice with the characters of Wonderland. Offer some comments on these conversations.
3. Find examples of nonsense in the events or dialogs of Wonderland and comment on why we enjoy the spectacle of nonsense in literary works like Alice. Are there any similarities with other children's literature or fantasy you've read like Doctor Seuss?
4. Find examples of confrontation and rudeness in Wonderland and make some observations about whether or not Carroll's fantasy resembles a "tooth and claw" evolutionary world? Do rudeness and confrontation have any survival value in *Wonderland*?

Reading Assignment: *On the Origin of Species*, chapters 3-6

In Chapters 3-6, Darwin expands massively into the central argument of his evolutionary model, exploring the concept of "selection" and the complex relationship between organic variation and external "conditions of existence." In the heart of his volume, Chapter 6, he describes the primary weaknesses of his theory and offers what he considers the best responses.

Here are some options for your annotations.

1. Look for examples of "natural selection" and comment on ones you think are especially interesting.
2. Darwin personifies natural selection (pp. 83-4) as something that "selects." Is there a fallacy in the way Darwin presents natural selection as an agent?
3. Look for examples of "sexual selection" and comment on how it differs from natural selection.
4. Make some observations about Darwin's discussion of Organs of extreme perfection (pp. 186-88).
5. Which of the "difficulties" Darwin discusses in Chapter 6 do you think is the most damaging to his theory?

APPENDIX C: Annotation Bibliography

Anderson, Sam. "What I Really Want Is Someone Rolling Around in the Text," *New York Times Sunday Magazine* 6 Mar. 2011: MM46.

Barney, Stephen A., ed. *Annotation and Its Texts*. Oxford: Oxford University Press, 1991.

Barthes, Ronald "The Death of the Author." *Image, Music, Text*. Ed. and trans. Stephen Heath. New York: Hill and Wang, 1977. 142-48.

Bush, Vannevar. "As We May Think." *The Atlantic Monthly* 176 July 1945.

Carruthers, Mary. *The Book of Memory: A Study of Memory in Medieval Culture*, 2nd ed. Cambridge: Cambridge University Press, 2008.

Greetham, David. *The Margins of the Text*. Ann Arbor: University of Michigan Press, 1997.

Iser, Wolfgang. *The Implied Reader: Patterns of Communication in Prose Fiction from Bunyan to Beckett*. Baltimore: The Johns Hopkins University Press, 1974.

Jackson, H.J. *Marginalia: Readers Writing in Books*. New Haven: Yale University Press, 2001.

Jenkins, Henry, and Wyn Kelley, eds. *Reading in a Participatory Culture: Remixing Moby-Dick in the English Classroom*. New York: Teacher's College Press, 2013.

Mathes, Adam. "Folksonomies – Cooperative Classification and Communication through Shared Metadata," *Graduate School of Library and Information Science, University of Illinois Urbana-Champaign*, Dec 2004. White paper. <date of access>

Nelson, Theodor. *Literary Machines: The Report on, and of, Project Xanadu*. Sausalito, California: Mindful Press, 1981.

Sherman, William H. "What Did Renaissance Readers Write in Their Books?" *Books and Readers in Early Modern England*. Ed. Jennifer Andersen and Elizabeth Sauer. Philadelphia: University of Pennsylvania Press, 2002.

Unsworth, John. "Scholarly Primitives: What Methods Do Humanities Researchers Have in Common, and How Might Our Tools Reflect This?" 13 May 2000. White Paper. <date of access>

Vanderwal, Thomas. "Folksonomy Coinage and Definition." *Off the Top*. 2 Feb 2007. Blog post. <date of access>

Wolfe, Johanna. "Annotations and the Collaborative Digital Library: Effects of an Aligned Annotation Interface on Student Argumentation and Reading Strategies," *Computer-Supported Collaborative Learning* 3 (2008): 141-64.

Zwicker, Steven. "Reading the Margins: Politics and the Habits of Appropriation," *Refiguring Revolutions: Aesthetics and Politics from the English Revolution to the Romantic Revolution*. Kevin Sharpe and Steven N. Zwicker, eds. Berkeley: University of California Press, 1998.

Other Works on the History of Annotation

Jardine, Lisa and Grafton, Anthony. "'Studied for Action': How Gabriel Harvey Read his Livy." *Past and Present* 129 (1990): 29–78.

Nichols, Stephen G. "On the Sociology of Medieval Manuscript Annotation." *Annotation and Its Texts*. Ed. Stephen A. Barney. Oxford: Oxford University Press, 1991. 43-73.

Rouse, Mary A. and Richard H. Rouse. *Authentic Witnesses: Approaches to Medieval Texts and Manuscripts*. Notre Dame, Indiana: University of Notre Dame Press, 1982.

Sherman, William H. *Used Books: Marking Readers in Renaissance England*. Philadelphia: University of Pennsylvania Press, 2008.